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FEDERAL COMMUNICATIONS COMMISSION
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From: David W Landram <daveland@access.digex.net>
To: A16.A16(RM-8653)
Date: [REDACTED]
Subject: RM-8653 Public Response

Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of)
) RM-8653
Allocation of Spectrum in the 5 GHz Band to)
Establish a Wireless Component of the National)
Information Infrastructure)

Response of David W. Landram

I fully support the Apple Computer proposal to allocate a small portion of the spectrum for unlicensed local access to the information infrastructure.

While some may proclaim this proposal as a way to "bypass the local telecommunications monopoly," I believe instead it an excellent way to bring competition and innovation to the local market. This will benefit current and future service providers as well as consumers.

By complementing current access routes, RM-8653 will make it possible for people and organizations to send and receive useful information they otherwise might not be able to share. It also will provide more convenient ways for current market participants to exchange information.

This flow of information will help enhance the lives of individual citizens, improve national productivity, and increase the public knowledge upon which our democracy is based.

Respectfully submitted,

David W. Landram
7501-B2 Spring Lake Drive
Bethesda, MD 20817

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JUL 24 1995

From: <stephen_jensen@ptltd.com>
To: A16.A16(rm-8653)
Date: [REDACTED]
Subject: Comments on RM-8653

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of

)

)
Allocation of Spectrum in the 5 GHz Band
) RM-8653
To Establish a Wireless Component of the
)
National Information Infrastructure
)

As a private citizen with interests in communication and technology, I find petition RM-8653 to be in the public interest. I feel that it will encourage invention and technological development by allowing many companies and individuals (not just one or a few) to develop competing equipment for use in this area.

This petition will allow many people to access the information currently available and make more information available by enabling more people to provide it. Licensing the spectrum or restricting it to one or a few companies would restrict those able to access information and prohibit many from providing information.

As our society moves away from traditional methods of storing and accessing information, the National Information Infrastructure is becoming more important. Making access to the NII available to everyone means making it affordable to even the lowest income families and individuals and making it convenient for everyone.

I strongly encourage you to consider adopting this plan.

Stephen Jensen
124 Ann Marie Drive
Bellingham, MA 02019

email: Stephen.Jensen@PTLtd.com

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JUL 24 1995

From: David B. Hack <davidhac@cpcug.org>
To: A16.A16(RM-8653)
Date: [REDACTED]
Subject: Apple Computer Petition

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FEDERAL COMMUNICATIONS COMMISSION
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In view of the July 25, 1995 deadline for submissions by electronic mail to the FCC in the above petition, I submit the following:

I write in support of the Apple Computer petition for allocation of a band of frequencies for use as shared, public NII spectrum.

I submit and endorse the following points made recently by

Paul Baran—the Inventor of packet networking and an internationally- renowned elder statesman of computer communications.

1. The Apple NII proposal raises the opportunity to consider a major new concept: how new technology can allow many more users to share the common radio spectrum at lower cost and regulatory burden.
2. This is a wake up call from the technical community to the FCC to draw attention to the implications of the new digital signal processing communications technology.
3. With success the amount of available spectrum space could be greatly increased to improve our ability to apply electronic communications to societal sectors not cost effective today, nor likely to be feasible with the present regulatory trajectory.
4. Public shared access by all comers without complex licensing is both technically and economically superior to the present concept of auctioning off the public spectrum to the highest bidder.
5. While the funds received from the one time auction appear to be significant, they are economically counterproductive. The high front end costs of spectrum licensing is a major disincentive to new technology risk investments in new radio technology. (Initial venture capital investments can rarely be justified if greater than a few million dollars, an amount far less than the bid price of national frequencies.) Only very large companies seeking monopoly positions can afford the front end costs of the bidding game.
6. The one time funds received by government for selling off the public's spectrum is small compared to the long term revenue potential over time. It is a public policy of selling the goose that lays the golden eggs rather than the eggs over time.
7. To ignore this new input information means continuing to keep a range of new services from becoming cost feasible.
8. We believe the new technology alternatives are so compelling that it will be just a matter of time whether it is adopted or not. When the new technology is adopted, either earlier or later, the world will look back and credit the FCC Commissioners for their vision, or view them in retrospect with the same attitude as we view the old East Germany leadership for trying to maintain the status quo.

Sincerely yours,
David B. Hack, Technology Writer & Consultant

The following files are attached:

1. Resume' of David B. Hack
2. Recent address by Paul Baran

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Content-Type: text/plain; charset="us-ascii"
Content-Disposition: attachment; filename="RESUME.T4"

No. of Copies rec'd
List A B C D E

DAVID B. HACK, Technology Writer & Consultant

9201 Wendell Street, Silver Spring, MD 20901

Office and Home: (301) 589-2848

E-mail: davidhac@cpcug.org

Reliable and specific reports and presentations on business and technology, for government, corporate or association purposes of an executive, legislative, or regulatory nature. Reports on the state of the art and current research in high technology business. Technology policy news coverage and analysis.

EXPERIENCE--

1973-1993: U.S. Library of Congress, Congressional Research Service, Science Policy Research Division. Analyst in Information Science and Technology. Specialized in satellite and terrestrial telecommunications technology policy, including common-carrier, broadcast, cable, and private-radio regulation by the Federal Communications Commission. Provided consulting service to offices of the U.S. Congress. Received the MERITORIOUS SERVICE AWARD from the Librarian of Congress, October 1993.

1970-1973: U.S. Executive Office of the President, Office of Emergency Preparedness, Applied Economics Division. Operations Research Analyst (Economics). Held TOP SECRET clearance.

1968-1970: San Francisco Federal Reserve Bank, Research Division. Quantitative analysis and forecasting of the U.S. economy.

1961-1965: General Electric Company, Nuclear Energy Division, Vallecitos Atomic Laboratory. Operations Physicist (Nuclear Engineer). Responsible for operations analysis, engineering computations, and development and testing of predictive models. Received the General Electric ACCENT ON VALUE AWARD, 1964.

PROFESSIONAL ASSOCIATIONS--

Washington Independent Writers. Member of the Information Technology Committee.

Institute of Electrical and Electronic Engineers, Committee on Computer and Communications Policy, Task Force on Telecommunications Infrastructure. Planned and conducted a national conference on the national telecommunications infrastructure.

The Ad Hoc Group, an association of Congressional, Executive Branch, corporate and trade association leaders in digital high-resolution video and high-capacity networks. Held 34 half-day workshops since 1988.

Telecommunications Policy Group. Composed of staff from the Federal Communications Commission, the National Telecommunications and Information Administration, the National Association of Broadcasters, the National Cable Television Association, the Maximum Service Telecasters Association, and Washington, D.C. area universities.

Capitol Telecommunications Professionals.

Society of Motion Picture and Television Engineers.

Federal Communications Bar Association.

EDUCATION--

Graduate study in economics at the University of California (Berkeley), Virginia Polytechnic Institute, and George Washington University.

B.S. in Physics Magna Cum Laude, University of Redlands, 1961.

SELECTED REPORTS & NEWS ARTICLES BY DAVID HACK--

- o Authored 18 news articles for Electronic News (a weekly electronics industry trade paper) reporting on standards development for the national information infrastructure (NII) and Federal Government technology policy. Aug. 1994 to present.
- o "NII Interfaces Analysis Overview" [report to the Electronic Industries Association]. Sep. 23, 1994. 19 p.
- o "Flat-Panel Displays." Presented in: Is DOD The Place To Fund Dual-Use Technology? 1993.
- o "Communications Satellites." Presented in: Japan Briefing Book. 1993.
- o Telephone Companies -- and Six Other Contributors to Competition in Local Telephone Service. 1993.
- o Cable Television -- and Eight Other Contributors to Competition in Multichannel TV Service. 1992.
- o Cable Television Addressability. 1992.
- o A Discounted Cash-Flow Model for Computing The Increased Monthly Subscriber Revenues Required to Support The Cost of Cable-TV Addressable Decoder Units. 1992.
- o Release of Government-Held Radio Spectrum for Non-Government Use. 1991.
- o "Standards and Standardization." Presented in: CRS Review, Major Issue Forum, Information Technology Revolution. 1990.
- o Digital Audio Tape Recording. 1990.
- o High-Definition Television in the U.S. -- What Does A Level Playing Field Look Like? 1988.
- o Digital Audio Recorder Act of 1987, Analysis and Policy Alternatives. 1987.

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MARCONI CENTENNIAL SYMPOSIUM

Bologna, Italy

June 23, 1995

Is the UHF Frequency Shortage a Self Made Problem?

Paul Baran

Atherton, California, USA

THE FIRST HUNDRED YEARS

Today on this occasion of the Marconi Centennial, we celebrate the accomplishments of the first hundred years of radio. The history of radio has been one of rapid and continuing progress. No letup is in sight. Each generation sees major advances over the previous art. Yet throughout the history of radio, scarcity of spectrum has been a fact of life. Lack of spectrum limits progress in creating new applications.

The constant shortage of spectrum space is not a new issue. One of the very first questions asked of young Marconi about his nascent technology was whether it would ever be possible to operate more than one transmitter at a time. ... New demand is like a constant vacuum, sucking up frequencies as they become available. Even today, with over 30,000 times more spectrum at our disposal than in Marconi's day, entrepreneurs wishing to implement new services encounter the same perpetual shortage of frequencies.

REGULATION

Although it's been called ether, the radio spectrum really is a lot like money. No matter how much some people seem to have, they always want more.

Enough never seems to be enough. Given the limited spectrum available combined with the growing demands of potential users, it became necessary early in the game to devise some means of rationing the spectrum resource. National and international regulatory structures evolved over time primarily to restrict access to the spectrum only for specific, allocated uses which were then further limited only to chosen institutional entities
- called licensees.

Today, we have new technologies that could potentially ameliorate this perennial shortage. But such technologies cannot be fully utilized because the very regulatory system initially set up to address the frequency shortage of the past stands in the way of the present and the future.

History has shown that there are very few mechanisms as effective at maintaining the status quo as a set of institutionalized regulations. Once set in regulatory concrete, reconsideration of the basic underlying assumptions is very difficult. While it will be an uphill fight to re-examine the basic underlying assumptions of any law or administrative rule, it is clearly not impossible. It will just take longer than if not so well institutionalized.

So on this day, as we celebrate the first one hundred years of radio, let us take this occasion to review some of our basic assumptions about spectrum utilization and to consider a possible alternative approach to frequency regulation in the future.

My words this afternoon focus on the UHF spectrum, 300 to 3,000 Megahertz, that most desired part of the radio spectrum for communications with high data rate for local area data devices. These are the frequencies preferred by designers seeking to use low cost electronic products to deliver new services. Today, the UHF band is the carrier of the bulk of terrestrial radio services – cellular telephony, broadcast television, cordless telephones, etc. And, it is used for low altitude satellites as well.

A PARADOX

To suggest that there really is no fundamental reason for a shortage of UHF spectrum is to violate the common wisdom. Tune a spectrum analyzer across a band of UHF frequencies and you encounter a few strong signals. Most of the band at any instant is primarily silence, or a background of weaker signals.

The spectrum analyzer connected to an antenna reveals that much of the radio band is empty much of the time! This unused spectrum might be available for transmission if we could take measurements and know exactly when and where to send the signal.

In part, the frequency shortage is caused by thinking solely in terms of dumb transmitters and dumb receivers. With today's smart electronics, even occupied frequencies could potentially be used.

DIGITAL VERSUS ANALOG

To the modern communications engineer, a lack of strong signals anywhere, no matter how distributed, represents a theoretically unused capacity that is available to be utilized with the proper signal processing. With advanced signal processing techniques, transmission of signals on top of undesired signals received at lower levels represents a potential source of usable transmission capacity. There is a caveat here. We are assuming digital signals that are able to operate with lower signal to noise ratios than analog signals. That means if the desired signal is but slightly stronger than an interfering signal, it can theoretically be received without error. This game doesn't work with old fashioned analog modulated signals, such as analog broadcast TV signals where even weak interference 40 dB below the picture is visible. 40 dB is a power ratio of 10,000 to 1.

That means if an interfering signal is 1/10,000 as strong as the analog TV signal it will be visible in the received TV image.

Compare this situation relative to the case of a digitally modulated signal able to operate at a 20 dB signal to noise ratio. 20dB is a power ratio of 1 to 100, or a tolerance 100 times as great as in the analog TV case. With the addition of error correction codes, some digital systems can operate at a 10 dB level or a noise tolerance 1000 times as great as our analog TV example.

How much new usable capacity could we gain by using digital transmission?

Think in terms of a curve of energy versus frequency at the receiver. The potentially available bandwidth can be visualized by inverting this received energy versus frequency curve and then adding a second curve above the first curve separated by an amount equal to the required signal to noise ratio. This new curve suggests the amount of potential spectrum actually available for reuse using the improved modulation. ...

In reality, the major spectrum hog is analog broadcast TV transmission. In the US and to an extent in other countries a spectrum analyzer will find much of the allocated VHF and UHF TV spectrum unused, even in big cities.

The UHF television band is punctured with vast empty holes called "taboo channels". These channels are left unoccupied because of the frequency selectivity limitation of early era television receivers. Today we know how to build far better receivers than when this early rule was adopted and when those frequencies were set aside.

We should never forget that any transmission capacity not used is wasted forever, like water over the dam. And, there has been water pouring here for many, many years, even during an endless spectrum drought.

LINK VERSUS SYSTEM THINKING

We have briefly considered digital's greater tolerance to interference and how this can be translated into better spectrum usage. But, this direction offers a relatively minor improvement as compared to other possibilities. To better capture these additional potential savings, it is necessary to think in terms of networked systems rather than single links.

Our understanding of the issues is most highly developed when considering how to make best use of a single communications channel or a single link.

...

The subject area that is most ripe for advancement is the focus of this paper -- learning how to optimize the overall interests of a multiplicity of competing heterogeneous users, each with different requirements, and all sharing a common block of shared frequencies.

The challenge is how to make best use of a common shared spectrum to handle disparate users, modulation and applications in a world of different system technologies, different system owners and different needs and objectives.

The argument will be made that instead of today's regimented channel by channel, highly centralized form of regulation, an alternative approach requiring only a minimal measure of cooperation would work to the maximum benefit of all.

A LINK IS NOT A SYSTEM

When wireless first started, a system comprised a transmitter and a receiver. Just as the telephone has evolved from being a pair of instruments connected by a pair of wires to a switching network, so too has radio moved from the transmitter and the receiver pair to becoming part of a larger switched system.

Communications networks are designed by choosing and joining together a combination of different media links and switches, as no single communications medium is ideal in all situations. If the link requirement is for long distance transmission, then optical fiber may be used. If the requirement is to address many users located hundreds of meters apart from one another, then coaxial cable or twisted pair may be the preferred medium, depending on the data rates for that part of the network.

One example of such a composite network is the cellular telephone network, composed in part by radio links integrally attached to the switched telephone network. Such networks are owned by a single entity and tend to be reasonably well optimized, with the economic factors considered as a whole by the network designers.

As we build more of these kind of networks in the future we are likely to find that wireless will increasingly becoming the preferred medium, for the tails of the network - allowing "tetherless" operation. This composite arrangement provides freedom and flexibility to the user and it combines access to the more cost effective longer distance transmission media.

RANGE REDUCTION

When we combine the radio tails with wired portions of the network, we face a tradeoff as to the amount of each media is used. In the UHF band the number of geographically dispersed users that can be simultaneously accommodated by a fixed spectrum varies as the inverse square of the transmission distance. Cut the range in half, and the number of users that can be supported is doubled. Cut the range by a factor of ten, and 100 times as many users can be served.

Reduce the power further, and then essentially any number of users can be fit into the exact same spectrum presently tied up in supporting a few longer distance, higher power users. In other words, a mixture of terrestrial links plus shorter range radio links has the effect of increasing by orders of magnitude the usable frequency spectrum.

... By authorizing high power to support a few radio users to reach slightly longer distances, we deprive ourselves of the opportunity to better serve the many. Automatic power reduction increases the number that can use a shared spectrum.

COMPOSITE PATH

How realistic is it to reduce the range of transmission for the relatively few to allow a greater number to benefit?

Consider today's millions of short range cordless telephones all sharing a minuscule slice of the radio spectrum, while a small number of licensed users occupy most of the spectrum. Most of these could be served by shorter range radios plus a telephone of fiber line to provide the longer distances sought. While the resulting path is not all wireless, neither are today's cellular systems. The advantage of tetherless operation is retained for the user's convenience. There is very little "give up."

In the US, for example, and, increasingly in other countries, there is an underutilized transmission capacity in already installed TV coaxial cable and the telephone twisted pair plant. Assuming a move to this direction, a vast communications capability to homes and businesses can be created to allow the support of a far greater number of users with greater bandwidths than feasible today.

MOVING RADIO BASED TV TO CABLE

We could significantly increase the available UHF bandwidth by giving each TV viewer "free" access to a TV cable to receive the present few off-the-air signals that they now receive. Let's look at the economics. In the United States, TV cable passes about 94% of the households, with 63% already connected. How much would it cost to connect everyone to cable and recycle the released bandwidth at a cost?

How Much Will it Cost?

Since TV cable systems are laid out without knowing which houses will take TV service or not, taps to serve each potential subscriber are in place. No additional power is required. The incremental cost of running a drop cable to each house is on the order of about \$40 per house.

How Much Would be Saved?

Almost 500 MHz of spectrum is presently assigned for over-the-air TV transmission. In the US the Federal Communications Commission recently raised about \$8 Billion selling access to about 70 MHz of UHF spectrum for Personal Communications System [PCS] services. This is about \$80 per US household, or about \$1.14 per household per Megahertz of bandwidth. And this cost only covers the cost of the license paid to the US Government - before any actual equipment is deployed!

If we assume that the TV band occupies about 480 MHz (80 channels) of spectrum, the value of this TV spectrum asset if sold on a comparable basis, would be worth about \$547 per household, or about 13.7 times the installation cost of the new drop cables.

What Does This Mean to the Cable Operator?

The cable operator would, of course, lose some revenue if each house were to be given free off-the-air signals. But, the number of cable subscribers who presently pay for off the air signals alone is small, and the received revenue is not large. The loss of revenue to the cable operator is minor compared to the potential revenue for higher value services made possible when the cable enter the houses of that one third of the population not presently reached by the TV cable. And, any short fall might be covered by the alternative revenues received from freeing up the UHF spectrum.

What Does This Mean to the Broadcast Station?

The TV broadcast station would now be able to reach all their present viewers and no longer have to pay for the TV transmitter costs. "Owning" the TV license places the broadcast station in a position to make far more money leasing frequencies than operating a TV transmitting station.

Of course, the issue of who really owns the spectrum is an interesting issue of public policy. We shall ignore this issue other than to note, that if economics are considered most broadly, TV broadcasting is probably not the most economical use of the spectrum. ...

EVOLUTION TO DIGITAL

With the movement of TV to cable, digital modulation is likely to be increasingly used. Digital modulation is already being used in early trials on TV cable systems.

Digital in lieu of the present analog modulation allows ten times as many TV signals to be sent over an existing TV cable. For example, the TV cable currently carrying 50 analog channels would be able to carry 500 TV channels.

SMART TRANSMITTERS

We don't have to wait for the eventual transfer of the UHF TV spectrum to cable. The existing spectrum can be more efficiently used by the use of smart receivers and transmitters.

Inexpensive microcontrollers would be used that first listen and then automatically choose preferred frequencies to avoid other signals in the band. It is really a matter of being a good neighbor. The smart transmitter reduces its power level to that needed to produce an error free signal and no more. A pristine pure slice of spectrum to have error-free performance is not required when using digital modulation. Digital logic on a chip implements error correcting codes to convert a small amount of redundancy in transmission enabling even highly corrupted signals to be cleaned up to emerge error free.

SPREAD SPECTRUM

One particularly interesting variant of digital - spread spectrum modulation can allow more users to share a common band of channels.

But, there is a regulatory lag in encouraging the fullest use of such technology as spread spectrum seems to require more spectrum space. The idea of signals taking more bandwidth is at variance with the mind set of government regulators whose objective has historically been to minimize the occupied bandwidth. And, this takes us to our next topic, Regulation.

REGULATORY HISTORY

Given the history of the shortage of spectrum leading to the necessity of rationing, it is understandable how national and international regulatory structures evolved, concerned in major measure with doling out bandwidth. The assumption of shortages is so institutionalized into regulatory policy that the basic assumptions that got us here rarely ever get re-examined.

And, when they are, changes tend to occur at glacial speeds.

We have a wide range of sophisticated but under-utilized technology with which to address this problem, but there is a roadblock as our institutionalized regulatory structure with its implicit assumptions that spectrum is a scarce commodity like real estate, leading to a zero-sum game. While this view of the spectrum may have been valid once upon a time, it is less so today, and will not likely be true tomorrow.

But, the rules of the regulatory game are set by governments, while the issues are primarily technical.

Government agencies tend to be staffed by lawyers who view a frequency as a unique property right. If I owned a frequency, then you can't use my frequency. It's mine, exclusively mine.

Yet, communications engineers know that statistical averaging of larger blocks of frequencies can allow for better usage. That is what cellular radio is all about. There was a regulatory delay in the allowance of cellular telephones in the US for well over a decade. In fairness, newer thinking is increasingly being incorporated in the regulatory decisions.

But, from the point of view of a technologist, the process is agonizingly slow and in need of rationalization.

ALTERNATIVE DIRECTIONS

Given the technological options described above, the assumption that there will always be a shortage of UHF frequencies deserves reconsideration. If our present regulatory approach is lacking, how can we do better?

It is my belief that public policy might be better served if we moved to an environment of near zero regulation.

In such an environment anyone and everyone would be allowed to use the spectrum, without the barriers to entry that keep out the true innovators.

Of course, there will be some minimal rules necessary, such as maximum allowable transmitted power and power densities. The micro-managed regulatory approach of today, such as who can use any single frequency is neither necessary nor desirable. If the hypothesis is correct that there is a potential for a limited amount of spectrum to carry all the traffic imaginable (assuming that the power and the range of the transmitters is limited), then the purpose of regulation would no longer be primarily keeping potential users away from the spectrum.

CHAOS?

Would this laissez faire form of regulation lead to chaos? Possibly, but most likely not. Consider the many millions of cordless telephones, burglar alarms, wireless house controllers and other appliances now operating within a minuscule portion of the spectrum and with limited interference to one another. These early units are very low power 'dumb devices' compared to equipment being developed, able to change their frequencies and minimize radiated power to better avoid interference to themselves and to others.

Of course that means that there will have to be enough frequency spectrum set aside to do so. But, once having done so, we would have created a communications environment able to handle orders of magnitude more communications than today.

REGULATION FOR THE FUTURE --THE INTERNET MODEL

The Internet provides an instructive model for the future of telecommunications regulations. The Internet allows worldwide communications at a far lower cost than any alternative; serving data users inexpensively, and opening access to the world's information to a greater number of people than ever initially imagined.

In the Internet, there is no central node, and only a minimal centralized management structure, limited to a few housekeeping functions such as standards setting. Local decisions essentially control the network. The independent pieces of the network operate in a coordinated manner with a minimum of restrictions. This lack of a limiting centralized structure has permitted the Internet to be responsive to a very large unregulated constituency and

allowing explosive growth and with increasing usefulness to its users. Probably the closest parallel structure to the Internet is the free market economy. We know that works. Will it work for regulating the radio spectrum?

The Internet is an organization of users sharing a common resource, as appropriate to the sharing of a common band of frequencies by all comers.

The Internet model for regulation would be similar to the data network in which each user follows a simple set of commonly observed rules. Which frequency to use and when, or which form of modulation to use would be left to each user. The Internet model has many of the characteristics of a desired communications regulatory approach for the future.

Such a direction does require a big evolution in the thinking of the current communications regulatory agencies. The present regulatory mentality tends to think in terms of a centralized control structure, altogether too reminiscent of the old Soviet economy. As we know today, that particular form of centralized system didn't work all that well in practice and, in fact, ultimately broke down. Emphasis with that structure was on limiting distribution, rather than on maximizing the creation of goods and services. Some say that this old highly centralized model of economic control remains alive and well today -- not in Moscow but, rather, within our own radio regulatory agencies.

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CC: FCCMAIL.SMTP("ccip@monroe.llnl.gov", "hierarchy@far...

From: <Cliff9@aol.com>
To: A16.A16(rm-8653)
Date: [REDACTED]
Subject: NII

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JUL 24 1995

Before the

FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of

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Infrastructure
Allocation of Spectrum in the 5 GHz Band

To Establish a Wireless Component of the National Information

RM-8653

Cliff Miller WB3CAW
648 Turnpike Road
Elizabethtown, PA 17022

FCC Commissioners:

I am writing to express my support for RM-8653. This e-mail will be followed by a hard copy via U.S. mail. It is

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gratifying that an e-mail address has been provided so that concerned citizens are able to respond by the July 24 deadline.

I have had an amateur radio license since 1976; therefore I am familiar with the benefits of spread-spectrum radio transmission.

I support this bill because I live in one of the few areas that is long distance to an internet node. I have been active in garnering petitions as per PUC regulations so that a formal complaint can be filed before the PUC requesting local calling to our county seat.

Passage of RM-8653 will assure equitable access for persons such as myself who are geographically challenged, as well as those who are financially unable to have access to information via computer.

Short range (15-30 mi.) wireless access to the "information highway" would allow inner-city libraries and rec centers to provide an inexpensive alternative for information access for clients that might not otherwise be able to afford this service.

In the ever expanding "global marketplace" it is important that our citizens not be relegated to a caste system of information "haves" and "have nots."

Allocation of a 300 MHz portion of the 5 GHz band would be in the best interest of the citizens of this nation.

Very truly yours,

Clifford P. Miller

From: Rick Strobel <rstrobel@infotime.com>
To: A16.A16(RM-8653)
Date: [REDACTED]
Subject: Apple NII Petition comments

RECEIVED

JUL 27 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

The following text succinctly and accurately describes my position on the Apple NII Petition:

>#####

>

>

>Inventor of Packet Networking (and much more!) Notes Some Values of
>Pub-Spectrum

>

>[Paul Baran is an internationally-renown, elder statesman of computer
>communications. He has been a frontiersman and innovator in datacomm since
>at least the 1960s - and *continues* to innovate ... when permitted by law.
>--jim]

>

>Date: 11 Jul 95 21:56:23 EDT

>From: Paul Baran <73507.2223@compuserve.com>

>

>This is written in response to [a request from] Jim Warren for reasons that
>the FCC Commissioners or others should want to learn more about the Apple
>NII Communications Commons proposal:

>

>1. The Apple NII proposal raises the opportunity to consider a major new
>concept: how new technology can allow many more users to share the common
>radio spectrum at lower cost and regulatory burden.

>

>2. This is a wake up call from the technical community to the FCC to draw
>attention to the implications of the new digital signal processing
>communications technology.

>

>3. With success the amount of available spectrum space could be greatly
>increased to improve our ability to apply electronic communications to
>societal sectors not cost effective today, nor likely to be feasible with
>the present regulatory trajectory.

>

>4. Public shared access by all comers without complex licensing is both
>technically and economically superior to the present concept of auctioning
>off the public spectrum to the highest bidder.

>

>5. While the funds received from the one time auction appear to be
>significant, they are economically counterproductive. The high front end
>costs of spectrum licensing is a major disincentive to new technology risk
>investments in new radio technology. (Initial venture capital investments
>can rarely be justified if greater than a few million dollars, an amount
>far less than the bid price of national frequencies.) Only very large
>companies seeking monopoly positions can afford the front end costs of the
>bidding game.

>

>6. The one time funds received by government for selling off the public's
>spectrum is small compared to the long term revenue potential over time. It
>is a public policy of selling the goose that lays the golden eggs rather
>than the eggs over time.

>

>7. To ignore this new input information means continuing to keep a range of
>new services from becoming cost feasible.

>

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To: A16.A16(RM-8653)
Date: [REDACTED]
Subject: Public COmments

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JUL 24 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)

Allocation of Spectrum in the 5 GHz Band) RM-8653
To Establish a Wireless Component of the)
National Information Infrastructure)

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COMMENTS OF DAVID HUGHES

I strongly support the recommendations of this petition.

I am filing as an individual who has, for the past 20 years been a nationally recognized advocate and hands-on practitioner (1993 Pioneer Award from the Electronic Frontier Foundation), originator, operator, developer-installer for the highest level of connectivity at the lowest possible cost for the most remote and least-connected American public - both individually and institutionally. With particular attention to the problems of public education, and rural areas.

'Universal Access' - to information and communications services by all individuals and institutions - should guide all public telecommunications decisions. All public officials have proclaimed this as a desirable national goal for the National Information Infrastructure. But this proposed 'NII' band takes the first major step in the wireless domain to make that an economic possibility for all. For it clearly focuses on regulating only the technological devices which use the spectrum, and does not grant spectrum licences for exclusive use by commercial service providers who can then dictate the terms under which the bands can be used.

With the recent, and projected, auctions by the FCC of important segments of the electromagnetic spectrum to the highest bidders for exclusive licensing arrangements, there will ample availability of commercial services for the public. But there is simply no compelling reason why the public spectrum should be all commercialized, or retained by government or sector-specific purposes given the current and forecast advanced in technology which can be used, freely, by that same public without significant interference.

The American Public is surely as entitled to its Public Spectrum, using only radios bought on the open market, if corporate America or Government are entitled to theirs.

For 15 of the 20 years I have been engaged in grass roots public telecommunications I have explored the use of digital wireless technologies, integrated into wired networks for public and private education, both rural and urban, small businesses - down to individual self-employed, work-from-home - urban telecommuting, and personal 'self-education.'

I have used everything from Ham-developed Terminal Node Controllers in licensed business bands, through analog radio, to spread spectrum radio under FCC Part 15 bands to attempt to extend affordable connectivity to all sectors of the US society. I have been repeatedly frustrated by the either the domination of the 'public' spectrum by commercial interests who seek to control the spectrum - which neither they nor the United States government 'capitalized' or invented in the first place - for their own private interests - as if that is identical with the 'public interest' - which it is not. Or by the severe limitations imposed on use of the spectrum by FCC regulations born in an era when there was no alternative way to prevent interference.

As I understand the history of government regulation of the electromagnetic spectrum, such regulation has only

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been required because the technical devices required to communicate successfully could cause unacceptable levels of interference. But now the processing power of chips in extracting information from noise at ever lower power of radiation has reached the point, already, when the very need for regulation of the bands of the spectrum itself can legitimately be called into question. Thus the treatment of the spectrum as if it will forever be a scarce resource, or that it should only be treated as private property auctioned off to the highest bidder - on the theory that is the only way to get the maximum use out of it - seems to fly in the face of revolutionary technological change which makes it ever more possible for it to be used by everyone, simultaneously, without interference, so long as the devices used capitalize on those technologies.

There are several sectors which are still being excluded by access issues rooted in the economic cost of bringing digital signals from networked points of presence, to end users. The 'last mile' problem.

EDUCATION

American K-12 public schools, some 84,000 schools in 11,000 school districts, with 2,000,000 classrooms serving 42 million students by 3 million teachers are still far behind the rest of nation in getting connected to the Internet. Or even connecting up at high bandwidth, closed internal, classroom based, school-district LAN networks, between multiple buildings within local school districts, or to the handmaiden of education - the public library system.

The reason for districts being so far behind is simple economics, multiplied 11,000 times across the country as the following will show:

- * Very few schools have even one dial-up modem line running to classrooms, which can support up to 28.8 bps affordable modems.

And none can conceive of 'one line per student' with modems on separate dialup lines. Even where the modems, and computers are affordable, as a one-time cost, the lines are not.

- * The most cursory survey of schools will demonstrate that virtually none are using, or will even consider, commercial 'cellular' phone services to meet their student-centered data needs.

- * Thus internal wired lans have to be multiplexed to local servers in school buildings, which themselves have to be connected to the outside by higher speed lines. But it requires an absolute minimum today for a small school, to be connected at 56kbs, requiring dedicated lines. For any larger school, or for the multiple-simultaneous use by students of higher bandwidth applications - such as graphical web pages, or video conferencing, fractional or full T-1 is required at the minimum. Even when a school can justify ONE commercial T-1 service being extended to an urban district, it CANNOT sustain the costs of 'distribution' within the district of that bandwidth. For today that either requires very costly internal cable-laying between buildings and schools, or by separate contractual telephone services for separate dedicated lines.

The reality is very few schools, except the most affluent, have even attempted to provide connectivity by such costly solutions, which are exacerbated by the fact that the overwhelming majority of US public K-12 schools are not even in operation for 3 vacation months a year - but dedicated commercial services costs are continuous.

High speed wireless bandwidth, where the only cost is one-time acquisition of radio tools, is a direct answer to connecting up America's schools.

- * Rural schools have an additional problem - distance from each other and from points of presence for interconnectivity to long distance networks. With the national trend toward deregulation of the Regional Bell Operating Companies (RBOCs), and thus the severe reduction or termination of 'rural subsidies' of phone services by urban service, the RBOCs are either 'bailing out' of unprofitable rural areas (US West is vigorously selling off its rural exchanges), or raising prices greatly. Cellular commercial telephone services are simply out of the question for schools - even where it reaches them. Dedicated data services are not only more costly for rural schools, they simply do not exist for many. ISDN is barely being offered in limited large urban centers now.

I am personally aware of the impact this has had on the efforts of rural schools to get connected in Montana, Wyoming, Utah, Idaho, rural Colorado. Areas such as the 114 one-room schools in Montana, or the 100 mile long, 50 mile wide 'San Luis Valley' of Southern Colorado are cases in point. The San Luis Valley has about 45,000 residents, in over 30 small towns, and 14

separate school districts, with both school children and school buildings usually 10 to 25 miles from each other. There is only one Internet 'point of presence' in the Valley - in the largest town, Alamosa, with 15,000. Schools which have attempted distance learning have been defeated by the costs of telephone company dedicated line services. Yet a 'network' of wireless connections with devices capable of high data rates, and ranges of 20 miles, could connect up the entire valley and all its schools to the Alamosa POP - which itself would profit from the volume of business. For it is only the 'last 20 miles' that is the obstacle to the Valley getting connected.

There is another aspect of K-12 education which will grow in importance. And that is access to the school, as an 'information' center and educational 'gateway' to networks by students from their homes, teachers, parents, and the public which has to pay all the bills in the form of taxes. The ability to use shorter range, local access, wireless from homes and offices to nearby 'community' schools without the necessity for schools providing banks of modem-equipped commercial telephones will be a giant assist in better connecting up schools to the surrounding public, on an intermittent, no added cost (for commercial communications service) basis.

This wireless NII proposal goes directly to the heart of the American 'networked education' problem. It corresponds to the fact that US K-12 education, nationally, is organized locally, in local school districts where there is a rough correspondence to population densities and geographic school district boundaries. The proposed 'range' of the permitted wireless NII bands, ('10-15km or more') is an excellent 'fit' to local school-centered, education.

Any argument that says that the current Part 15 FCC bands, where educational use of spread spectrum is sufficient, misses a very important point. Such use would still be 'subordinate' to other specialized uses, and if, for example, in congested urban areas any 'superior' priority users, claiming interference, could shut down the entire wireless networks of urban schools and colleges. The recent FCC ruling permitting high power automobile tracking commercial systems in Part 15 areas, is just such a threat to attempted use of current Part 15 frequencies for public education. No school system is going to invest in, and rely on, Part 15 frequencies if they know there is a chance they will be shut down by higher-priority users.

Education needs to depend on frequencies that only the laws of physics impose limitations on, not the laws of man.

VERY SMALL BUSINESS - IN FACT DOWN TO ONE-PERSON HOME BUSINESSES

The microcomputer revolution has made it possible for millions of Americans to work for themselves, particularly in 'information' intensive businesses. Low speed modem communications over twisted pair ordinary telephone circuits have made it possible for these individuals to be connected to the rest of the online world at affordable costs.

However advances in the power and complexity of online communications has put greater and greater demand on the required 'bandwidth' which has to be used to get and stay competitive, and for individuals with small servers - such as Unix, OS2, or NT type operating systems - to present today's sine qua non of business - web pages, with its bandwidth-intensive graphics. Ordinary twisted pair lines at tariffed rates are rapidly becoming insufficient, even with the fastest modems now manufactured - 28.8kbs modems. At least 56kbs of bandwidth is needed already today. In fact my understanding of Shannon's Law would hold that modems can never get about 34kbs.

This then compels any small business to go to 56kbs lines - which are a substantial investments (DSU, CSUs, Routers), the installation by commercial telephone companies of dedicated lines, and substantially higher - than business phone lines - monthly costs, ONLY to reach ISP services, which carry their own costs.

This Proposed NII band will permit them to connect up with ISPs, with non-interfering, and non commercial-service links of 56kbs and higher, for only the cost of the radios and interface. My calculation is that that will reduce their costs for 'access' by from 25 to 40% of the total cost, and bring it more into line with the proportionate costs of local loop communications with respect to all other costs. Thus it will be stimulative of small business entrepreneurship.

TELECOMMUTING

Pressures on costly road and highway systems by traffic, environmental problems with automobile emissions,

and other capital intensive costs are causing a nationwide move toward 'telecommuting' by the work force. National surveys find that up to 9 million American workers are working at least part time from home, with estimates of 3 million, and growing, number working full time. With telecommunications making this ever more possible.

But in ever more cases being reported to me, is the need for higher-than-plain telephone service bandwidth being needed. Buying commercial dedicated line services at 56kbs is overkill, ISDN is not available, or likely to be available everywhere. Internal company Public Spectrum wireless makes all kinds of sense for this 'internal company network' purposes. And could stimulate an increase in the proportion of American workers economically telecommuting, which in turn takes pressure off of other public infrastructures, and is therefore in the broad public interest.

It is rather ironic that AT&T, who opposes this Petition, is trying to take leadership in 'telecommuting,' has 35,000 managers who telecommute, and is sponsoring the national 'Telecommute America' coalition, promoting work at home or from outlying centers. But it is clear that their employees may enjoy highly subsidized access using their own circuits - which, in the current Congressional rage of deregulation - will probably permit them to extend their own local loop circuits to their own employees.

But the 'rest of us' will not have that kind of subsidized communications from our homes.

COMMUNITY NETWORKING

Local 'community' telecommunications is a very American social phenomenon which extends into electronic space, community dialogue forms that hitherto have been only face to face. As one small town newspaper publisher noted "Its the New England Town Hall meeting over an Electronic back fence in Colorado."

This important extension of local community discourse and organization - paralleling national trends toward decentralization - has spawned large initiatives that seldom make the news in the hype of the national 'Information Highway.' The non-profit Freenets, local computer bulletin-boards, municipal (government) sponsored networks, Senior nets, and kids nets. With whole organizations devoted to their encouragement such as the national Marino Foundation, and the annual 'Ties that Bind' conference devoted to 'community networking.' As a matter of fact, Apple Corporation co-sponsors such conferences. It may not be coincidental that this

NII Spectrum proposal comes from Apple - which appears to have a social conscience that I find distinctly lacking in some of the communications giants who seem only to want spectrum for their business purposes - not for the civic good.

But even though local dial-up systems have been adequate in the past, it is clear that such systems have increasingly to be connected to the Internet, if only, within any state or municipality, to give the public no-cost access to community resources. Public wireless spectrum is one of the few ways that the costs of connectivity between central small servers, and points of presence in the community, or to government, library, or university, or other 'civic' networks - can be held down. High bandwidth, low cost, in a local region. That is the great need for PUBLIC telecommunications.

LIBRARIES

The use of public spectrum wireless in, and between local library branches in larger cities, and to local servers from libraries is another major, every-city, opportunity.

The highly developed Colorado public ACLIN (Access Colorado Library Information Network) is a perfect case of what Public spectrum could do, that is now only being done - at taxpayers expense - in a more costly manner.

The Pikes Peak Public Library District of Colorado Springs, for example - the first library in the US which permitted modem dialup to its resources (1981) - and which now is offering connectivity to and through the Internet - now Gopher, later full Web Page materials, has 14 branch libraries in the city. Currently they are connected only by 9,600 baud dedicated phone lines from their character graphic terminals - which is barely adequate for text data base searching. It is wholly inadequate for graphical materials access - such as the Boulder Valley Library which is digitizing its large

photographic collection for remote viewing.

The District has been compelled to upgrade its terminals to full PC's, at one-time capital costs. But they are budget limited to upgrade the connection to each of their libraries with 56kbs or fractional T-1 lines via commercial carriers. Fourteen dedicated lines is not a trivial monthly cost. 56kbs wireless with 10 miles range would be a good alternative solution.

In rural areas, with small towns, the problem is not branches, it is the costs of connecting to a server - which could itself be a non-profit government, or educational network. Again public spectrum could permit the connecting up of libraries where there simply would be no budgetary option to do it commercially.

Public Libraries are the one central and major answer for net access to the general public which does NOT own computers, commercial network accounts, or the skills to use them. They are the access points of last resort for the information poor.

JOBS

There is a myth that has been perpetuated by Commissioners of the FCC recently, that the only job-producing 'business' which can come out of licenced spectrum, is that of communications 'services.'

I submit, and use the very healthy microcomputer and modem production industry - neither of which are themselves tied to a particular 'service' as examples, that the provision of Public Spectrum will open the door for a comparable research, development, manufacturing, marketing and mass-use of devices, the production of which can be a very healthy economic sector indeed. And it will be a very competitive sector too, as anyone who can technically meet the challenge, be licenced in their devices by the FCC, and compete in the marketplace will be able to grow new businesses in the US. Even in the crowded and limited Part 15 spectrum, I can identify at least 50 companies making devices that operate there.

With a Public NII spectrum that number could rise to hundreds of companies and tens of millions of manufactured radios and associated devices. If 'competition,' 'technolgical innovation' and an economically 'healthy' radio industry is part of the factors which weigh in the FCC decisions - as it appears they have in the matter of licence auctions - then a decision to grant a Public use spectrum, will be a real stimulator of such worthy public policy goals.

And, because the US is ahead in the development of digital radio technology, this can have a followup effect in much of the 3d world, where wireless solutions are the ONLY solution to many of their infrastructure problems. The eventual foreign markets for such devices could be very large indeed, as their host nations also follow the US lead in spectrum allocation involving new technologies.

While I believe that the policy of exclusively licencing spectrum to existant, high bidding communications giants, is actually an invitation for reduced-competitiveness in the manufacturing of devices, and a suppressive hand in technological innovation. Companies which deploy large numbers of licenced spectrum devices have less incentive to replace them with better devices that companies whose only sales will be because their radios are better than the next company's in using the Public Spectrum.

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From: Clauss, Chris <CLAUSS1@applelink.apple.com>
To: A16.A16(RM-8653)
Date: [REDACTED]
Subject: Please approve Petition RM8653

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)

Allocation of Spectrum in the 5 GHz Band) RM-8653
To Establish a Wireless Component of the)
National Information Infrastructure)
In the Matter of)

Petition for Rulemaking to Allocate) RM-8648 the 5.1 - 5.35 GHz Band and Adopt)
Service Rules for a Shared Unlicensed)
Personal Radio Network)

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I would like to express my interest in seeing Petition RM-8653 approved.

I would also like to ask that Petition RM-8648 be rejected by the FCC.

It is my belief that the public would be well served by the allocation of a small part of the huge broadcast spectrum for use by private citizens, schools, and other organizations as described in Petition RM-8653. Modern communications have the power to improve the way we live, work, play, and learn. In many ways the airwaves have become as important a natural resource as the air we breath and the water we drink. Airwaves are an vital part of our environment and a portion should be reserved for private citizen and education data use. Public access networks will empower our citizens and schools and dramatically improve US competitiveness in the global economy.

I have spent the last seven years working with K-12 schools throughout New York state to implement modern telecommunications and networking technologies. My goal has been to improve the way that students learn by helping them to use and understand the modern technologies which are changing our society in so many dramatic ways. I have witnessed first hand the powerful and beneficial effect that computational and communications tools have had on the learning process. Students become energetic and active learners when they utilize computer and telecommunications technologies in their studies. They take more pride in their work when they are collaborating with others and they learn to have more empathy with students who are different from themselves. The success of Internet in K-12 clearly demonstrates that pervasive communications helps students to learn more as well as become more understanding of others. We need to get Internet tools into the hands of our students as quickly as we can.

Existing cable and telephone companies have done little to foster a better education environment in American public schools. Even in 1995, most classrooms do not have telephones or televisions. Every single business in America has a phone and yet very few classrooms do. I find that I have to act as "translator" for schools when they discuss data communications with telcos and cable operators. These organizations are so focused on arcane technical details and services that they are of little help to the schools in understanding how data communications can improve the learning process. School teachers and administrators across the country are spending an inordinate amount of time attempting to learn how to cope with and acquire data services from the telco and cable companies. This is time that would be much better spent providing students with a better education. An open wireless data communications infrastructure would allow teachers and administrators to connect their schools together and increase colaboration without having to waste valuable time learning telco and cable TV technologies and procedures.

Please let the free market do what it does best - provide powerful and cheap technology to consumers. Petition RM-8648 must be rejected because it seeks to increase the strangle hold that telcos and cable operators have on schools. These organizations have not improved eduation in the past and further enhancement of their already considerable power would be a major step backwards for education reform in this country. In contrast, public education would be greatly enhanced if Petition RM-8653 is approved. The market would quickly create inexpensive yet powerful wireless hardware which would be much easier for schools to understand and implement without the cost of high priced datacomm consultants and service fees. Schools are already underfunded for the vital work that

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we ask them to perform. We have a moral obligation to give our students the best education that we possibly can and to give schools the tools needed to make them successful.

Please act now to improve students' access to the important technologies of the future. This will greatly enhance the learning process and provide us with students that are more likely to be successful when moving into the business world. We have the opportunity to get the advantages of modern technology into the hands of our students. Please approve Petition RM-8653 and reject Petition RM-8648 for the sake of our kids and to improve the USA's competitiveness in the global economy.

Thank you for your careful consideration of this vital matter,

**Christian C. Clauss
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FEDERAL COMMUNICATIONS COMMISSION
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From: <rpooles@nas.com>
To: A16.A16(RM-8653)
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Subject: RM-8653 & RM-8648 Citizen's Informal Comments and Opinion

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
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Allocation of Spectrum in the 5 GHz Band) RM-8653
To Establish a Wireless Component of the)
National Information Infrastructure)

In the Matter of)
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Petition for Rulemaking to Allocate) RM-8648 the 5.1 - 5.35 GHz Band and Adopt)
Service Rules for a Shared Unlicensed)
Personal Radio Network)

At bottom, there is a fundamental and profound issue to be decided. The electromagnetic spectrum, like land, is finite and ineligible of expansion. There will never be more of it created.

The exponential increase of population in this century has not yet resulted in the saturation of the land's ability to accommodate us all, though anyone with vision has no difficulty foreseeing that such a thing is possible (if not imminent).

The simple expedient of building upward, itself a side effect of advances in engineering and materials science, allows many more people to be accommodated on a very small footprint on the surface of the planet. This is invariably done where there is high perceived desirability attendant upon living/working in a given place. And, at the same time, there remain vast tracts of desolate wilderness uninhabited to date. Much of the empty space, and a significant fraction of the habitable areas, rest in the hands of government (imminent domain & outright purchase).

No one seriously challenges the concept of the government appropriately exercising this power given that it is for the ostensible benefit of all citizens. And there is still a LOT OF LAND LEFT. There is precious little EM spectrum left.

How long would the populace (all of whom fundamentally appreciate land and its relationship to their well-being) sit still for a government that has/takes control of the entire of this nation's land resources and parcels it out to the benefit of established commercial interests and leaves but a tiny and barren piece of it, pro forma, for the private citizens to use? How well did this work in the extinct USSR?

Having been an airline pilot, having sailed the open ocean and enjoyed various forms of FCC licenses over my lifetime - for radio operations that require a degree of accountable, competent and informed use - I believe that I understand those EM spectrum applications which are essential, i.e. marine, aircraft, police, fire, etc. It is important to note these are MOBILE and ESSENTIAL to the safe and efficient use of legitimate infrastructure. This is a corollary to the land upon which highways and railroads are constructed. Almost every other form of spectrum utilization, currently taken for granted, is OPTIONAL.

Spectrum can be utilized much more effectively. Just as building up, instead of horizontally, can accommodate a thousand dwellings where only a few could have existed before. But this does not address the fundamental issue of whether FCC fully comprehend that it belongs to me, a citizen. I question FCC's right to give preference to industry as the default in allocating this finite resource.

Most of the current EM spectrum applications (taken for granted since time out of mind) can and should be put underground; the recaptured part of the spectrum may then be released for more appropriate use. Laboratory results have established that fiber-optic technology can achieve 1,000 gigabit bandwidth and it is made largely of

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